CMP Seminar

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Strain Modulated Superlattices in Graphene

The quest to create novel material systems with designer electronic properties has often led to the investigation of interfaces and superlattices. The potential of customizing properties by merging different 2D materials via vertical or horizontal stacking to create van der Waals or lateral heterostructures seems limitless. In this presentation I will discuss an alternative approach. The local electronic properties of a continuous graphene sheet can be periodically varied by strain modulation, created by exerting extreme (>10%) shear and tensile strains. Similar to a sheet of plastic wrap pulled taut at its edges, the graphene buckles, forming nanoscale ripples. Within these strain-induced ripples the carbon-carbon bond lengths vary from short to long, creating dense and rare regions of the material respectively, with properties as different as in two different materials. Thus a single graphene sheet effectively becomes an electronic superlattice in which novel electronic states arise at the interfaces. I will present the results of scanning tunneling microscopy and theoretical investigations of this system, and discuss their potential to help realize many longstanding theoretical proposals, such as valley filters, snake states and electron optics in graphene and other 2D materials.

Monday, March 9th, 2020 at 4:10 p.m.
Room: 1400 BPS Bldg.
Host: Stuart Tessmer